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ON GNATS' SCALES.

By JABEZ HOGG, Esq., Hon. Sec. R.M.S., &c.

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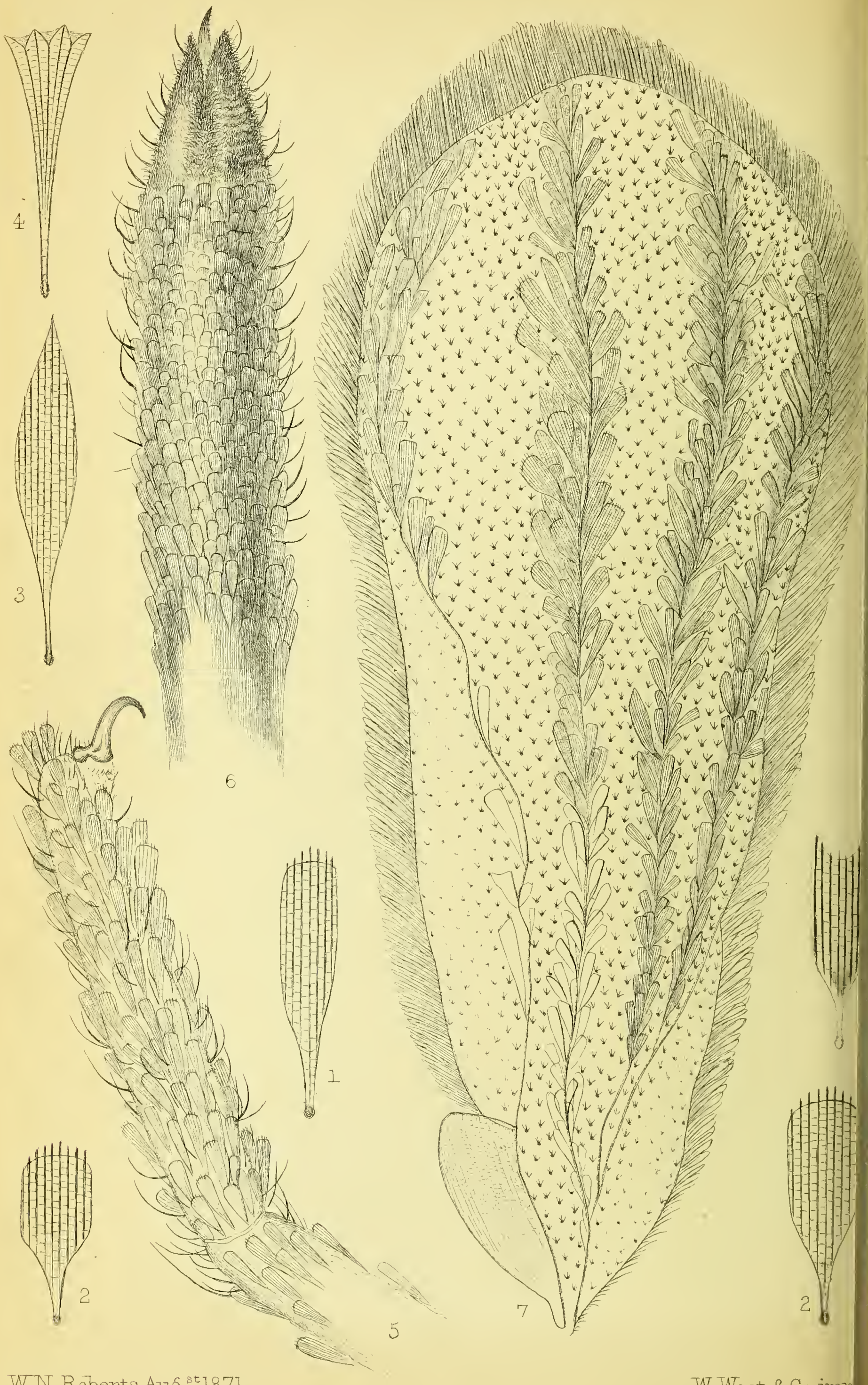

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Gnat's Scales.

VI.

ON GNATS' SCALES.

By JABEZ HOGG, Esq., Hon. Sec. R.M.S., &c.

It is said that history repeats itself decennially: if this be a truth in the progress of nations, it appears to be scarcely less true with regard to science, which not unfrequently furnishes to the pages of our periodical literature an old discovery furbished up in so attractive a dress that it sometimes passes as a newly-recorded fact. This is certainly the case with a supposed discovery referred to at page 102 of the August number of the 'Microscopical Journal.' The writer mentions that "in the spring of 1868, while engaged in examining the head of a gnat, he was surprised to discover that the proboscis and palpi were clothed with scales entirely like those of butterflies." The paper on this subject appears in a German scientific journal, "under the joint authorship of Dr. E. Muller and Professor F. Delpino," and it has been translated for the 'American Naturalist' by Mr. R. L. Packard, a gentleman well acquainted with the Natural History world, who therefore should have known there was nothing novel in placing on record observations which appeared in my book on the Microscope* published in 1854, and repeated in all subsequent editions, some 60,000 copies of which have made their way to every part of the civilized

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DESCRIPTION OF PLATE CI.

Fig. 1.—Battledore scale from proboscis of *Culex pipiens*.
,, 2.—Flattened out scales from body.
,, 3.—Pointed scale from margin of wing.
,, 4.—Trumpet scale from thorax, each × 350 diameters.
,, 5.—Portion of leg and foot.
,, 6.—Clothed proboscis.
,, 7.—Arrangement of scales on wing.
,, 8.—Scale, *Culex* ——, variety unknown.

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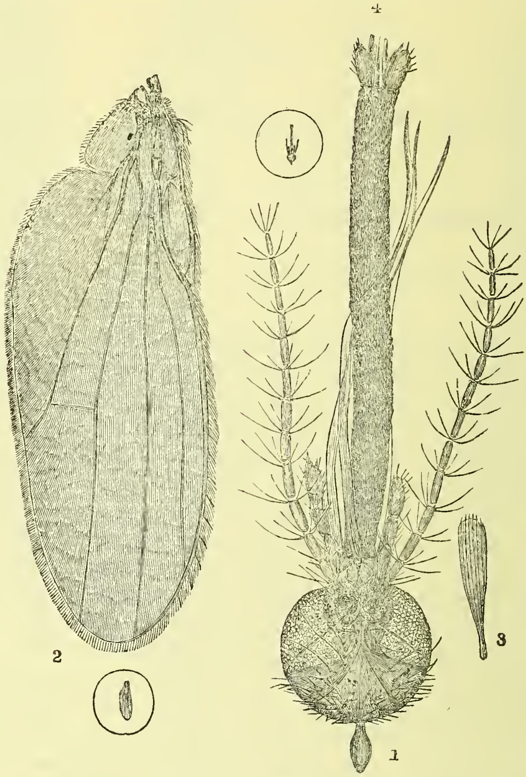
* *The Microscope: its History, Construction, and Application.* G. Routledge and Sons, Broadway, Ludgate Hill, London.

world. A drawing of the proboscis, clothed with scales, is given page 287 *first edition,* 599 of the seventh edition; a single scale detached is seen near it; and again, at page 611, another scale, more highly magnified, and exhibiting the "*wavy appearance*" spoken of by the German authors, but which curiously enough does not quite accurately represent the structural characteristics of the scale. The waviness is owing to the under surface being seen rather out of focus. I stated, however, that "the curiously-formed proboscis is covered with feathers or scales;" and, it will be seen, that in the woodcut a scale is placed side by side with other test-scales from Lepidoptera and Spring-tails, in order that the structural similarity might be noticed. It is not perhaps so very surprising, after all, that this fact should have escaped the observation of German authors, since it has received little recognition from English writers on either entomology or microscopy. So far as I have been able to ascertain, no one has described this peculiarity of the proboscis of the Gnat; and indeed no one



Woodcut from First Edition.

would expect to find so curious a departure from the ordinary characteristic of the order Diptera as that presented by the Culicidæ. Francis Walker, Esq., F.L.S., mentions in his 'Insecta Britannica,' 1856, that the veins of the wings of Culex, Anopheles, Corethra, Mochlonyx, and Aëdes, "are fringed with scales," but makes no mention of their occurrence on other parts of the insects. As both German authors and American translator have repeated the "wavy appearance" error, and made sundry other slight mistakes, it may be as well to enter a little more fully than I have hitherto done into the structure and variety of "Gnats' scales."

Scales are a generic characteristic of the Culicidæ, and although presenting pretty much the same appearance differ essentially in form. There are four distinct kinds: the proboscis, palpi, and legs are entirely covered over with the battledore scales, represented at Fig. 1. The nervures or venations of the wings, and portions of the body of the insect, have regularly arranged rows of scales, shown at Fig. 2; while from the marginal edges of the wings project slender scales, which terminate in a point, Fig. 3. The intermediate portions of the wings and body are covered with fine hairs, the thorax with tufts of feathery scales somewhat peculiar in form, Fig. 4, the pedicles of which are considerably longer than the rest, while the upper part gradually widens out and terminates abruptly in a crenated edge. These may be briefly described as *trumpet-shaped* scales. In each case the scale is inserted by a narrow pedicle into the chitinous membrane, gradually assumes a scutiform appearance, and terminates in a crenate or pointed edge. The basement membrane is homogeneous, and the upper layer is corrugated or traversed by longitudinal ribs, and these again are regularly and finely striated throughout in the horizontal plane. It is the striations on the ribs which, when seen slightly out of focus, give to the scales a wavy appearance.

It is curious to find portions of *C. pipiens* completely clothed, and other parts free from scales. The legs are covered throughout, as shown in Fig. 5, and the feathers seem to take the place of hairs in other families of the Diptera. The proboscis, which is half the length of the male insect, is used as a prehensile organ and as a sheath or scabbard to the exquisitely-formed set of penetrating instruments. A slender needle-like piece, seen in the drawing, Fig. 6, just projecting out of the sheath, is serrated towards the tip, and thickened at the back like a scythe. It is said to be employed as a suctorial apparatus, or, when the insect is irritated, for conveying a fluid which is thought to be poisonous, from the minute receptacle situated at the base of the proboscis. The feathered sheath can, by a little careful dissection, be drawn off the slender set of instruments. To secure perfectly good scales, and preserve them in an undisturbed state, the Gnat must be secured as it is seen issuing from the larva case. The scales should also be mounted dry, as when immersed in balsam or fluid they become too transparent. They are an excellent test for a ⅛-inch objective.

It is not improbable that the scales of even the various species of Culex will, after a more careful examination than I have been able to make, be found to differ, as upon going over the collection of Gnats in the British Museum, I discovered loose among them the scale represented at Fig. 8. It is therefore possible that each species may be found clothed with scales of a peculiar form: that is, the males, for the females have not this specific character.

The body of *C. annulatus* is entirely covered with alternate rings of dark brown and white-coloured battledore scales; and the hairs projecting from its sides are longer and more numerous than in *C. pipiens* or *C. musquito*. The "feathered antlers" pectinate antennæ of the male insect, although destitute of scales, are exceedingly handsome objects: they surmount the most brilliant set of compound ocelli it is possible to find. In short, he wears much finer clothes and is better dressed throughout than his female companion. When the piercing apparatus is sent into the flesh of a victim, the proboscis appears to divide, and it is then thrown up and turned back upon the head like the trunk of an elephant.

The Gnat-like midges, so common in this country, belonging to Tipulidæ, very closely resemble Culicidæ. *Chironomus plumosus*, often mistaken for a Gnat, has plumed antennæ; but on no part of wings or body can scales be found; the same remark applies to the rest of the species. The resemblance between many of the perfect insects belonging to the genus is striking, while their larvæ differ very considerably from each other. The club-shaped balancers, halteres, are more developed in Tipula than in Culex. The genus *Psychoda* have been thought to be clothed with scales, however they are not; their wings and bodies, on the contrary, are thickly covered with long, peculiar hairs. Some of these little creatures present under the microscope a gorgeous appearance. The various parasites infesting Diptera deserve the attention of microscopists. Ocypete is found on several species; Obisium, with its crab-like forefeet, is often seen crawling up the legs of the house-fly. Many specimens of minute Hymenoptera may also be secured, since it is well known that these lay their eggs in the bodies of Dipterous insects.

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